

## CLAIMS

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- 1    1. A device for dithering a three-color source image, comprising:
  - 2        a first logic for dissecting a color space of said source image into a plurality of tetrahedrons each having four vertices;
  - 4        a second logic for locating one of said tetrahedrons that contains a point corresponding to a value of a pixel of said source image;
  - 6        a third logic for generating a random number as a threshold value for dithering said pixel of said source image;
  - 8        a fourth logic for assigning a probability density corresponding to each of said vertex of said located tetrahedron;
  - 10      a fifth logic selecting a vertex as an interim output provided by said threshold value through an inverse probability distribution function derived from said probability densities of said vertices; and
  - 13      a sixth logic for locating an output point in an output color space corresponding to said selected vertex.
- 1    2. A device for dithering a source image according to claim 1, wherein said first logic that dissects said color space further comprises:
  - 3        a first logic for truncating said value of said image pixel of said source image, for locating a 3-dimensional cubic subinterval containing said point; and
  - 5        a second logic for further dissecting said 3-dimensional cubic subinterval into a plurality of tetrahedrons.
- 1    3. A device for dithering a source image according to claim 1, wherein said logic for generating a random number is a 2-dimensional array of pseudo-random numbers overlaying on top of said source image.

1       4. A device for dithering a source image as recited in claim 1, further comprising a seventh  
2 logic containing one-dimensional look-up tables for converting an 3-component input colorant  
3 value into said pixel value.

1       5. A device for dithering a source image as recited in claim 1, wherein the device is  
2 embedded in a central processing unit in a computer system.

1       6. A device for dithering a source image as recited in claim 1, wherein said device is  
2 embedded in a processor in an output device.

1       7. A device for dithering a source image as recited in claim 6, wherein said output device is  
2 a printer.

1       8. A device for dithering a source image as recited in claim 6, wherein said output device is  
2 a display monitor.

1       9. A method for dithering a three-color source image, comprising the steps of:  
2           dissecting a color space of said color image into a plurality of tetrahedrons each having  
3 four vertices;  
4           locating one of said tetrahedrons that contains a point corresponding to a value of a pixel  
5 of said source image;  
6           generating a random number as a threshold value for dithering the said pixel value of said  
7 source image;  
8           assigning a probability density corresponding to each of said vertex of said located  
9 tetrahedron;  
10          selecting a vertex as an interim output provided by said threshold value through an  
11 inverse probability distribution function derived from said probability densities of said vertices;  
12 and  
13          locating an output point in an output color space corresponding to said selected vertex.

1    10. A method for dithering a source image according to claim 9, wherein said method that  
2    dissects said color space comprises the further steps of:

3         truncating said value of said image pixel of said source image, for locating a 3-  
4         dimensional cubic subinterval containing said point; and

5         further dissecting said 3-dimensional cubic subinterval into a plurality of tetrahedrons.

1    11. A method for dithering a source image as recited in claim 9, further comprising the steps  
2    of:

3         converting an input colorant value into said pixel value through one-dimensional lookup  
4         tables, prior to said step of locating a tetrahedron.

1    12. A method for dithering a source image according to claim 9, wherein the step of  
2    generating a random number includes the step of fetching a pseudo-random number from a 2-  
3    dimensional threshold array overlaying on top of said source image.

1    13. A device for dithering a source color image via weighting coefficients associated with a  
2    plurality of sample points in a source color space of said source color image, comprising:

3         a first logic for generating said weighting coefficients of said sample points, wherein said  
4         weighting coefficients are probability densities of said sample points;

5         a second logic for generating a random number as a threshold value for dithering a pixel  
6         value of said source image;

7         a third logic selecting a point from said plurality of said sample points provided by said  
8         threshold value through an inverse probability distribution function derived from said weighting  
9         coefficients of said points; and

10         a fourth logic for locating an output point in an output color space corresponding to said  
11         selected point.

1    14. A device for dithering a source image according to claim 13, wherein said logic for  
2    generating a random number is a 2-dimensional threshold array overlaying on top of said source  
3    image.

1       15. A device for dithering a source image as recited in claim 13, further comprising a fifth  
2 logic containing look-up tables for converting an input colorant value into said pixel value.

1       16. A device for dithering a source image as recited in claim 13, wherein the device is  
2 embedded in a central processing unit in a computer system.

1       17. A device for dithering a source image as recited in claim 13, wherein said device is  
2 embedded in a processor in an output device.

1       18. A device for dithering a source image as recited in claim 17, wherein said output device  
2 is a printer.

1       19. A device for dithering a source image as recited in claim 17, wherein said output device  
2 is a display monitor.

1       20. A method for dithering a source color image via weighting coefficients associated with a  
2 plurality of sample points in a source color space of said source color image, comprising the  
3 steps of:

4              generating said weighting coefficients of said sample points, wherein said weighting  
5 coefficients are probability densities of said sample points;

6              generating a random number as a threshold value for dithering a pixel value of said  
7 source image;

8              selecting a point from said plurality of said sample points provided by said threshold  
9 value through an inverse probability distribution function derived from said weighting  
10 coefficients of said points; and

11             locating an output point in an output color space corresponding to said selected point.

1       21. A method for dithering a source image according to claim 20, wherein the step of  
2 generating a random number includes the step of fetching a pseudo-random number from a 2-  
3 dimensional threshold array overlaying on top of said source image.